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A REVISION OF THE AFRICAN SPECIES OF THE GENUS *SPATHULINA* ROND. (DIPTERA TRYPETIDAE)

By H. K. MUNRO, B.Sc.

(Read 1st June, 1938.)

WITH 3 FIGURES.

Spathulina Rond.

Rondani, 1856, *Dipt. Ital. Prodr.* 1 : 113.

Coquillett, 1910, *Proc. U.S. nat. Mus.* 37 (1719) : 607. *S. sicula* Rond. as genotype; *Campiglossa* Rond. as synonym, but not accepted later.

Bezzi, 1918, *Bull. ent. Res.* 8 : 220; 9 : 28; 1920, 10 : 213, 257; 1924, 15 : 79, 80, 132; *Ann. S. Afr. Mus.* 19 : 525, 534. These references are mostly to generic tables or to tables of species, in part *Spathulina*.

Senior-White, 1923, *Cat. Indian Ins.*, 4. *Trypetidae* : 27.

Efflatoun, 1924, *Mém. Soc. R. ent. Egypte* 2 : 92.

Hendel, 1927, in Lindner, *Die Fliegen Pal. Reg.*, 49. *Trypetidae* : 115; 1931, *Bull. Soc. R. ent. Egypte* 15 : 6.

Shiraki, 1933, *Mem. Fac. Sci. Agric. Taihoku* 8 : 430.

Syn. : *Ditricha* Rond., in part.

Genotype : *Tephritis tristis* Lw. (syn. *sicula* Rond.).

The genus has been redescribed by Hendel, Efflatoun and Shiraki; the limits accepted here are those given by Hendel (1927). The main characters only need be noted.

Head of normal shape; *frons* flat and bare, slightly projecting before eyes; *antennae* a little shorter than face; *labellae* hooked but not very long; cheeks and genae moderate; *bristles*, two superior and two inferior orbitals, ocellars moderate, occipitals whitish. *Thorax* normal, dorsum dusted; bristles brown, dorsocentrals close to suture, notopleural, pteropleural and sternopleural whitish, two scutellars. *Legs* simple. *Wing* normal, black with hyaline spots and indentations; third vein bare. *Abdomen* normal, wholly dusted, but shining, with end segments more or less smooth and polished. Base of ovipositor conical, not flat and trapezoid except sometimes in dry specimens.

Hendel placed *Spathulina* in the Tephrellini, but it may be better located in the Tephritini closer to *Tephritis*. However, until other genera have been studied further, the relationships must remain somewhat undecided. That *Spathulina* is not nearly allied to *Urelliosoma* may be suggested with some confidence; on the other hand, its connection with the species Hendel has placed in *Tephrella* may be greater. Of these I have seen no specimens, but it may be stated here that there seems to be some doubt as to whether they are really congeneric with *Tephrella decipiens* Bez., a question that will be discussed in a later paper.

To some extent the question seems to depend on the degree to which the abdomen must be considered "dusted." Efflatoun says it is "devoid of pollen"; Shiraki in his tables (op. cit. p. 376) refers to the abdomen as "shining, black, very slightly tomentose," and it may be noted that he places *Spathulina* next to *Tephritis* in the text. Hendel (1927) gives the following : "Charakteristisch ist die glänzend schwarze, durch keine dichtere Bestäubung

alterierte Färbung." In species of *Tephritis* the dorsum of the abdomen appears on the whole to be rather thickly dusted, approaching what is found on the thorax, but in some species, such as *T. nesii* Wd. and *T. ramulosa* Lw., the dust on the abdomen is not so very much greater than it is in the most heavily dusted species of *Spathulina*, and the abdomen is, in fact, shining. In *Tephrella decipiens* Bez. from India, the abdomen is more shining, but still faintly dusted, although not much more so than in some species of *Spathulina*. The "dust" or "tomentum" is discussed again later in this paper.

Biologically, too, the species of *Spathulina*, which infest Compositae, are closer to those of *Tephritis*, but the exact systematic position can perhaps be better discussed after a review of the Tephrellini has been concluded.

Of the species included in *Spathulina* by Bezzi in 1924 only those with two scutellar bristles and bare frons are retained here. Two species, *S. abyssinica* Bez. and *S. euryomma* Bez., differ from the others in having the femora black and no hyaline spot at the tip of the wing. As I have now no specimens in my possession for further comparison, it is not possible to indicate their position more clearly. I have suggested that they may be included in *Tephrella*, but this is doubtful, and nothing is known of their host-plants. I have a specimen taken near Petrusburg in the Orange Free State that seems to be very like *S. abyssinica*; it is, however, so damaged as to make it impossible to say with any certainty where it should go—possibly in *Spathulina*.

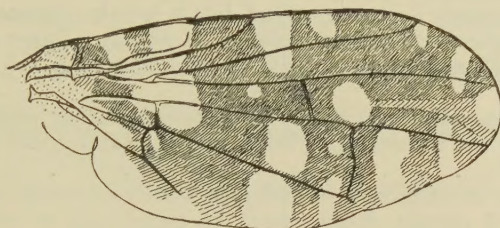
The other species, those with the yellow legs, are, as far as I can understand, typical of the genus. As grouped in Bezzi's tables, they are much confused and difficult to understand. He used the wing-pattern very largely, and with the smaller number of specimens he had for study, the difficulties were perhaps not apparent. The fact is that in these species, in particular in the *S. hessii* group, the wing-pattern is very similar in all, and subject to much the same range of variation. During the past few years many specimens, both bred and collected, have been accumulated, and lately, through the kindness of Dr. John Smart, some have been received from the British Museum. A study of this material has made it possible to discover what may be a correct solution to the various groups or "species" concerned.

Two main characters are used, namely, the length of the base of the ovipositor and the extent of the polished surface on the hind segments of the abdomen. The length of the base of the ovipositor is usually compared with that of the pre-abdomen, but this is often unsatisfactory as the latter is in many cases more or less shrivelled or bent. The wing-length is much more suitable and is measured in a straight line from base to tip. The pre-abdomen in the female is about one-third the wing-length, in the male nearly half, the ratio varying in different species. The base of the ovipositor may be termed short when it is not more than one-quarter, and long when about half the wing-length.

The degree to which the hind segments, especially the last in the male, are smooth and polished seems to be very constant. For the most part the dorsum is covered with light dust, also called "tomentum" or "pollen." In these species, in which the dust is slight and the integument black, the surface, although "shining," is very different from the smooth, polished appearance where there is none at all. When the dust is very slight and is examined under high magnification, it appears like faint "etching" on a shining surface. If it is dense, as on the dorsum of the thorax, the surface is dull and matt.

Owing to the similarity both in appearance and in variation of the wing-pattern, particularly at the apex of the wing, it cannot be used extensively.

The pattern at the base of the wing seems more constant. In fig. 1 is shown a typical wing in which the so-called "apical fork" is well developed. This is, however, subject to considerable irregularity, the wing of *S. arcucincta* (fig. 2, A-D) showing an extreme reduction. Further, although certain of the hyaline spots on the disc may be present or absent throughout, there is rather more constancy and some parallelism among the species in the presence of two or of three hyaline indentations in the second posterior cell. So much so that there may perhaps be a slight suggestion of geographical races. This is most noticeable in the *S. arcucincta* series, but there is not sufficient material to warrant any definite statement. Speaking generally, the specimens from the Cape Peninsula show most irregularity in the terminal wing-pattern, and have only two indentations in the second posterior cell—but occasionally a specimen



1

FIG. 1.—*Spathulina hessii* Wied. Wing.

with three is found there. The British Museum specimens from the Katberg have also two indentations and the apical fork is more constant. Finally, it is those specimens from the drier, Karroo areas (Middelburg to Hopetown districts in the Cape Province) that have both a regular apical fork and three indentations in the second posterior cell—rarely two.

Thus, on the length of the base of the ovipositor and on the extent of polished surface on the end of the abdomen, it is possible to recognise four species of the *S. hessii* (yellow-legged) group, the group also having some black in the wing base. The presence of two or three hyaline indentations in the second posterior cell is regarded as indicating varieties. It is deemed well to name some of these where a name has not otherwise been available.

In the following tables an attempt is made to show the possible relationships of the various species and varieties.

Table of species and varieties.

- 1 (4). Femora black; no hyaline spot at end of first posterior cell.
- 2 (3). First basal cell black, no spot at end of submarginal cell *abyssinica* Bez.
- 3 (2). Hyaline spots in outer end of first basal, and large hyaline spot at end of submarginal cell *euryomma* Bez.
- 4 (1). Legs yellow and apical hyaline spot on wing.
- 5(10). Base of wing hyaline.
- 6 (9). The entirely hyaline base of wing includes costal cells, inner end of discal, of second basal and of anal cells.
- 7 (8). Spot in submarginal cell directly below the inner spot in marginal cell, and a little before upper cross-vein; base of ovipositor as long as last two segments of pre-abdomen. Mediterranean species *tristis* Lw.

- 8 (7). Spot in submarginal cell towards outer side of the inner one in marginal, and directly over upper cross-vein; base of ovipositor as long as last three segments *biseuarestina* Bez.
- 9 (6). Hyaline base less extensive, black pattern including outer end of costal cell (which, however, is hyaline at its outer end) and outer ends of second basal and anal cells, the inner end of discal cell without hyaline spot. Dorsum of thorax with distinctly coarse, yellowish pubescence *acroleuca* (Schin.).
- 10 (5). Base of wing with a strong bar from black in anal region to humeral cross-vein, with a well-marked black spot in outer costal cell; occasionally the bar is reduced to a dark spot in hyaline base and one on humeral cross-vein, but in any case the inner end of discal cell is hyaline (see 26). Pubescence on dorsum of thorax yellowish, but fine, and often inconspicuous.
- 11(14). Abdomen entirely dusted or etched, but in female extreme hind margin of last segment sometimes polished in middle. Large species, wing length 4.25 mm. or less. Base of ovipositor long, 0.5 times length of wing.
- 12(13). Apical fork usually distinct, even if sometimes rather irregular *hessii* Wied.
- 13(12). Apical fork not formed, spot below and that above end of third vein coalesced *hessii* Wied. var.
- 14(11). Last one or two segments of abdomen wholly or partly polished.
- 15(32). Abdomen of normal shape, about $1\frac{1}{2}$ times long as wide, and not markedly wider than thorax, nor rounded.
- 16(27). Males.
- 17(20). Usually not more than hind third of last segment of abdomen polished.
- 18(19). Two hyaline indentations in second posterior cell
euarestina Bez., var. *piscatoria* var. n.
- 19(18). Three such indentations (? male of *euarestina* Bez.).
- 20(17). Last segment entirely polished, or only etched narrowly on anterior edge.
- 21(26). Black bar in base of wing strong.
- 22(25). Two hyaline indentations in second posterior cell.
- 23(24). Apical fork not developed, the hyaline spots above and below tip of third vein more or less narrowed, placed along wing-margin and quite or to some extent confluent, there being no, or a moderate, isolated black spot at tip of third vein *arcucincta* Bez.
- 24(23). Apical fork moderately to well developed
arcucincta Bez., var. *simplex* Bez.
- 25(22). Three hyaline indentations in second posterior cell
arcucincta Bez., var. *arida* var. n.
- 26(21). Bar at base of wing reduced to isolated spots
arcucincta Bez., var. *elegantula* Bez. (see notes in text).
- 27(16). Females.
- 28(31). Base of ovipositor long, 0.35 to 0.4 times length of wing; last segment of pre-abdomen at least polished.
- 29(30). Three hyaline spots in second posterior cell *euarestina* Bez.
- 30(29). Two such indentations *euarestina* Bez., var. *piscatoria* var. n.
- 31(28). Base of ovipositor short, 0.25 to 0.27 times length of wing. Wing length about 3.0 mm. (Refer back to 21(26).)
- 32(15). Abdomen about as wide as long, much wider than thorax; dust or etching very slight. Small species.
- 33(34). One hyaline indentation in second posterior cell *péringueyi* Bez.
- 34(33). Three such indentations *péringueyi* Bez., var. *triplex* var. n.

BIOLOGY.

It is to be regretted that specimens of all the species and varieties have not been bred, more especially those of the *S. hessii* group. The known host-plants belong to the Compositae and are detailed below.

Spathulina acroleuca Schin. : *Ceruana pratensis* Forsk., flower; *Matricaria aurea* (L.) Sch. Bip., flower; *Spilanthes africana* D. C., flower; *Bidens* sp., flower.

Spathulina tristis (Lw.) : *Phagnalon saxatile* Cass., terminal gall; *Phagnalon rupestre* D. C., terminal gall.

Spathulina biseuarestina Bez. : *Athrixia elata* Sond., flower; *Athrixia pulegioides* [?], flower.

Spathulina hessii Wied. : *Helichrysum vestitum* Schrank, flower.

Spathulina euarestina Bez., var. *piscatoria* Mro. : *Helipterum gnaphaloides* (L.) D. C., flower and terminal gall.

Spathulina arcuincta Bez., var. *arcuincta* Bez. : *Metalasia muricata* (L.) D. Don., terminal gall.

Spathulina arcuincta Bez., var. *simplex* Bez. : *Metalasia muricata* (L.) D. Don., terminal gall.

Spathulina péringueyi Bez. : *Elytropappus rhinocerotis* (L. f.) Less., terminal gall.

Spathulina abyssinica Bez.

Bezzi, 1924, *Bull. ent. Res.* 15 : 134.

Munro, 1935, *Ann. Mus. nat. Hung.* 29 : 150, fig. 17 (wing) ♂.

Only the type from Hamaraja, Abyssinia, in the collection of the Hungarian National Museum, is known.

Spathulina euryomma Bez.

Bezzi, 1924, *Bull. ent. Res.* 15 : 134.

Munro, 1935, *Ann. Mus. nat. Hung.* 29 : 151, fig. 18 (wing) ♂.

Only the type from Dire-Daua, Abyssinia, in the collection of the Hungarian National Museum, is known.

Spathulina tristis (Lw.).

Loew, 1869, *Z. ges. Naturw.* 34 : 18. *Tephritis*.

Hendel, 1927, in Lindner, *Die Fliegen Pal. Reg.*, 49. *Tryp.* : 117, pl. 7, fig. 2, textf. 55.

Syn. : *sicula* Rond., *luisieri* Tav., *sepia* Beck. (Details of the synonyms are not repeated here.)

Séguy, 1930, *Mém. Soc. Sci. nat. Maroc* 24 : 174; 1932, *Enc. Ent. (Dipt.)* 6 : 164. (Records apparently same as those given by Hendel.)

This is a Mediterranean species, occurring also in the Canary Islands. *S. biseuarestina* Bez. may be regarded as the South African representative—a comparison follows.

European writers record *S. tristis* as a gall-forming species on *Phagnalon saxatile* and *P. rupestre*.

Spathulina biseuarestina Bez.

Bezzi, 1924, *Ann. S. Afr. Mus.* 19 : 539, pl. xiv, fig. 88; *Bull. ent. Res.* 15 : 134.

Munro, 1925, *Un. S. Afr., Dept. Agr., Ent. Mem.* 3 : 55.

This species is very like the Mediterranean *S. tristis*, and, apart from the slightly longer base of the ovipositor, the only differences are in the wing

pattern. The two may be distinguished on the characters tabulated below, but it may be noted I have had no specimens of *S. tristis*, relying on Hendel's descriptions and figures.

	<i>tristis</i> (sec. Hendel)	<i>biseuaestina</i>
Base of ovipositor.	As long as last two segments of pre-abdomen.	As long as last three.
Hyaline spot in submarginal cell.	Directly below inner one in marginal, and slightly before upper cross-vein.	Towards outer side of spot in marginal and directly over upper cross-vein.
Inner two-fifths of third posterior cell (except extreme inner end hyaline).	With large hyaline spots.	Entirely black except rarely with one or two small hyaline spots.
Hyaline spot in outer three-fifths of third posterior cell.	Trilobed, i.e. has appearance of three coalesced spots.	Usually one rounded spot, sometimes irregular.
Below end of sixth vein.	A faintly marked but complete hyaline spot.	No such spot.

In *S. biseuaestina* the fronto-facial angle seems to be nearer (only a little more than) a right angle than is the case in the figure of the head given by Hendel of *S. tristis*. The abdomen is lightly and evenly dusted in both sexes, but in the Pretoria females the last segment is distinctly less so and more shining than the segments before it. The base of the ovipositor is cone-shaped, narrow at the tip.

Material. 7 ♂♂, 18 ♀♀ (including the type male and female), Pretoria, 1923 to 1936, collected and reared from flowers of *Athrixia elata* (H. K. Munro), 1 ♂, Louis Trichardt, 7.vi.28 (H. K. Munro), taken in beating net over bushes of *Athrixia* sp. A female, Umtamvuna, Natal, 10.vii.25 (A. L. Bevis). 6 ♂♂ and 9 ♀♀, Cowey's Hill, near Durban, Natal, vi.1935, from flowers of *Athrixia pulegioides* (W. E. Marriott) (M. 529). 3 ♂♂, Cowey's Hill, 25.vii.35 (H. K. Munro); 2 ♂♂ and 1 ♀, Kloof, Natal, 27.ix.36 (W. E. Marriott); and 1 ♀, Moseley, Natal, 18.x.36 (W. E. Marriott).

Biology. Species of *Athrixia* appear to be the only host-plants. The larvae live in the flowers, one in each, and there is no sign of enlargement or of gall-formation. Pupation takes place in the flower. When the plant is in flower the adult flies are usually quite common, and may be seen flitting about on the flowers; in the off-season, particularly during the dry winter months at Pretoria, the flies are not to be found. In the spring, however, when the plants are coming into bud, the flies may be found.

Spathulina acroleuca (Schin.).

Schiner, 1868, *Novara Reise, Dipt.* : 268, 112. *Tephritis*. Sydney.

Bezzi, 1913, *Mem. Indian Mus.* 3 : 65. *Tephritis*, ?*Tephrella*. 1928, *Dipt. Fiji Islands* : 117. *Spathulina*.

Hendel, 1927, in Lindner, *Die Fliegen Pal. Reg.*, 49. *Tryp.* : 116, pl. 7, fig. 3. *Spathulina*. Syn.: *parcegutata* Beck., *parca* Bez., and *acrosticta* Bez. Africa and Indian-Australian region.

Malloch, 1931, *Ins. Samoa*, 6. *Dipt.* : 266. *Spathulina*. Samoa and Tonga Islands.

Shiraki, 1933, *Mem. Fac. Sci. Agric. Taihoku* 8 : 431. *Spathulina*. Formosa.

Munro, 1935, *Arb. phys. angew. Ent.* 2 : 266. *Spathulina*. Formosa, Australia, Egypt and South Africa.

Syn.: *acrosticta* Bezzi, 1918, *Bull. ent. Res.* 9 : 29, ♀, Durban; 1924, *ibid.* 15 : 134. *Spathulina*. Type in British Museum. *parca* Bezzi, 1913, *Mem. Indian Mus.* 3 : 159, pl. x, fig. 62. *Oxyina*. India; *Phillip. J. Sci.* 8 : 328. Philippine Islands; 1918, *Bull. ent. Res.* 9 : 28; 1924, *Ann. S. Afr. Mus.* 19 : 539, pl. xiv fig. 85. East London; 1928, *Dipt. Fiji Is.* : 116. As var. of *acroleuca*. *Spathulina*.

- Hendel, 1915, *Ann. Mus. Nat. Hung.* **13** : 465. *Euribia*. Formosa.
 White, 1923, *Cat. Indian Ins.*, **4**. *Tryp.* : 27. *Spathulina*.
 Munro, 1926, *Un. S. Afr., Dept. Agr., Ent. Mem.* **5** : 28. *Spathulina*.
 Fulmek, 1927, *Misc. Zool. Sumatrana* **11** : 3. *Oxya*. Sumatra.
parceguttata Becker, 1903, *Mitt. zool. Mus., Berlin* **2** : 134, pl. 4d, fig. 48. *Oxya*. Egypt.
 Bezzi, 1908, *Bull. Soc. ent. Ital.* **39** : 141. *Oxya*; 1918, *Bull. ent. Res.* **9** : 28; 1924, *ibid.*
15 : 134; 1928, *Dipt. Fiji Is.* : 117. *Spathulina*.
 Efflatoun, 1924, *Mém. Soc. R. ent. Egypte* **2** : 93, 126, Pl. iv, fig. 5; 1927, *Bull. Soc. R. ent. Egypte*
1927 : 37, Pls. *Spathulina*. Describes larva and puparium.

At present there is nothing more to add to what I said in 1935 regarding the synonymy of this species.

The known distribution in South Africa is limited. The first specimens I collected (recorded by Bezzi in 1924) were taken at East London in the Cape. Later Mr. W. E. Marriott reared a number of specimens (M. 493) from flowers of *Spilanthes africana* found at Umbilo (Durban, Natal) and I took a single specimen at Tshakoma, near Louis Trichardt in the northern Transvaal, November 1933. In addition Mr. J. Vinson, Entomologist, Department of Agriculture, Mauritius, sent me a few he had obtained from puparia in the flowers of *Bidens* in the Island.

Spilanthes africana is a low-growing Composite plant; those that Mr. Marriott found infested in February 1935 occurred along the banks of the Umbilo River. The puparia were found inside the rather elongate, cone-like base of the flowers.

In Egypt Efflatoun has recorded the larvae in flowers of *Ceruana pratensis*.

Spathulina hessii (Wied.).

- Wiedemann, 1830, *Zool. Mag.* **2** : 48; *Aussereurop. Zweiflüg. Ins.* **2** : 501. *Trypeta*.
 Loew, 1861, *Berlin. ent. Z.* **5** : 255. *Trypeta*. Cape.
 Becker, 1903, *Mitt. zool. Mus. Berlin*, **2** : 131. *Trypeta*.
 Bezzi, 1908, *Bull. Soc. ent. Ital.* **39** : 140. *Trypeta*; 1918, *Bull. ent. Res.* **9** : 24. *Tephrella*;
 1924, *Ann. S. Afr. Mus.* **19** : 542, pl. xiv, fig. 92, ♀. *Spathulina*. Cape.
 Munro, 1935, *Un. S. Afr., Dept. Agr., Ent. Mem.* **9** : 39.
 Syn. *Spathulina hessii*, var. *simplex* Bezzi, 1924, *Ann. S. Afr. Mus.* **19** : 543—male only.

This is the largest of the group of species with the bar in the base of the wing. The wing-length is 4.25 mm., but some specimens are much smaller, about 3 mm. The pattern usually has more hyaline spots than are to be seen in other species of the group; there is nearly always a second hyaline spot at the outer end of the third posterior cell, and it is mostly extended to join that at the lower outer corner of the discal cell; the apical fork is as a rule distinct (in Cape Peninsula specimens) even if irregular, but in one, noted later as a variety, it is not developed. The abdomen is entirely dusted, more strongly and definitely in the male, in the female sometimes rather faintly, and the hind edge of the last segment may be polished in the middle. The base of the ovipositor is cone-shaped, and about half the length of the wing. The puparia are dull black.

Biology. The species seems to occur mainly in the south-western part of the Cape Province, one aberrant specimen, noted later, having been taken at George. Bezzi records a male from Kimberley, but Dr. Hesse told me that this is not to be found in the collection of the South African Museum. It is doubtful if it is *S. hessii*.

As previously recorded, numerous specimens were reared from larvae and puparia in the flowers of *Helichrysum vestitum* collected on the mountains above Muizenberg on the Cape Peninsula. The plant is very numerous on the plateau,

forming bushes eighteen inches to two feet in height thickly covered with the large white flowers; from a distance the bushes look like sheep in the veld.

On the first visit, 11th November, only young larvae were found here and there, but later, on the 19th, large and small larvae were numerous and some puparia were found. This was particularly so in one locality; nearer Muizenberg, where the flowers are picked regularly every year, the larvae were very few.

As the larvae had, for the most part, not pupated, many infested heads were collected and kept in a closed jar, as well as flowers on stalks kept in water. In the loose heads larvae pupated, but most of the flies that emerged were undersized, while from the flowers kept in water, a larger proportion of full-sized flies was obtained. Flies taken at that time in the beating net may have been some that had survived from the previous season; at any rate, none could have developed in the present season's flowers. Full-grown larvae were found in flowers that were only just opening, thus the fly must have laid the eggs in the buds, for which purpose the long ovipositor would be needed. The exact time of egg-laying was not observed, but the larval period would not be less than two weeks, probably three, and the pupal period about three weeks. The puparia were closely surrounded by the seeds, but quite free, not being glued at all, so that they readily fall out if the flower is broken open; in old flowers the empty puparia are more or less embedded in the base. Fresh, infested flowers could easily be detected as the florets above the larvae were pushed up so as to project somewhat. There were from one to four puparia in each flower, sometimes five.

Spathulina hessii (Wied.) var.

A single female taken at George, Cape Province, January 1922 (*R. E. Turner*), has the apical fork of the wing-pattern undeveloped, the hyaline spots above and below the end of the third vein being coalescent as is the case in typical specimens of *S. arcucincta* (see fig. 2, A-D). It agrees in the length of the base of the ovipositor, but the last tergite is not strongly dusted, although normally it is so definitely. There are three indentations in the second posterior cell, the innermost reaching the fourth vein, the two outer not. It is not considered necessary to give this variety a name.

Spathulina arcucincta Bez.

It may be said that the solution to the riddle presented by the series of species discussed here was found after a study of what may be termed the *S. arcucincta* group; the forms included are *S. arcucincta*, *S. simplex*, *S. elegantula* and *S. arida*. The characters that unite them are the length of the base of the ovipositor, about a quarter of the wing-length, and the almost entirely polished last abdominal segment of the male. It is possible that *S. arida* and *S. elegantula* may be regarded as distinct species; unfortunately no reared specimens of either are available. *S. arcucincta* and *S. simplex*, however, represent the extremes of a simple series, and both have been reared from identical galls on the same plant.

Spathulina arcucincta Bez., var. *arcucincta* Bez.

Bezzi, 1924, *Ann. S. Afr. Mus.* **19** : 540, pl. xiv, fig. 86; *Bull. ent. Res.* **15** : 134.
Munro, 1929, *Ann. S. Afr. Mus.* **29** : 19.

Typical specimens of this form may be readily recognised, as the hyaline spots above and below the end of the third vein are confluent and form a more

or less arcuate band at the wing tip (fig. 2, a); the variations in the wing-pattern have previously been noted (Munro, 1929) and some are shown in fig. 2, a to 2, d. Included here are specimens in which the apical fork is not developed or only barely suggested.

The material consists of the following: Camps Bay, 5 ♂♂, 14 ♀♀, Clovelly, 2 ♂♂, Muizenberg, 3 ♂♂, 1 ♀, Fishhoek, 1 ♂, x.-xi.1931 (*H. K. Munro*) (included are seven bred specimens), Milnerton, 1 ♂, 2 ♀♀, St. James, 2 ♂♂, 2 ♀♀, Camps Bay, 2 ♂♂, x.1935 (*W. E. Marriott*) (all bred), Milnerton, xii.1925 (*R. E. Turner*) 1. (All the foregoing localities are on the Cape Peninsula.) Swellendam, Cape, ii.1932 (*R. E. Turner*) (the last two specimens in the British Museum material). Tradouw Pass, Swellendam district, xi.1925 (*S.A. Museum Exp.*).

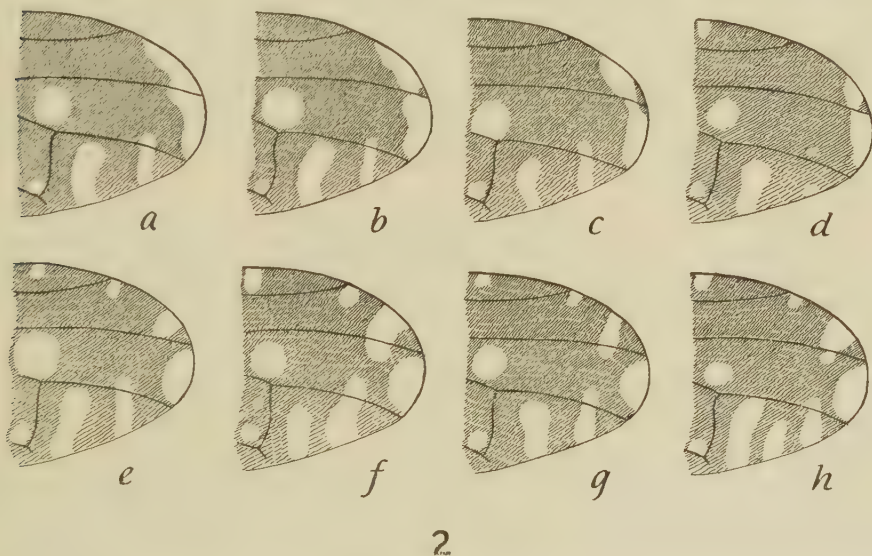


FIG. 2.—Outer ends of wings to show variation in hyaline markings in the apical pattern. a to d, *S. arcucincta*, e to g, var. *simplex*, h, var. *arida*.

Spathulina arcucincta Bez., var. *simplex* Bez.

Bezzi, 1924, *Ann. S. Afr. Mus.* 19 : 543, pl. xiv, fig. 91; *Bull. ent. Res.* 15 : 134.

This form was described from a male and a female, and I am indebted to Dr. A. J. Hesse of the South African Museum for information on the types which I have not been able to re-examine. Dr. Hesse has told me that the abdomen of the male type is entirely dusted; this means that it is a specimen of *hessii*. As regards the female, Bezzi noted that the base of the ovipositor was short, and from Dr. Hesse's measurements it has the proportions recorded for the *S. arcucincta* group. In spite of the fact that the male belongs to another species, the name *simplex* may be retained for the one extreme of the *arcucincta* series as represented by the wing-pattern of the female (see Bezzi's figure), in which the apical fork is present. In the *arcucincta-simplex* series the development of the apical fork is brought about by the appearance of two hyaline spots, one above the other, one just below the third vein, the other just above the fourth, and on the inner side of the apical spot which

becomes limited between the ends of the two veins. When the fork is fully developed, the upper spot becomes united to the inwardly produced spot below the end of the second vein, and the lower to the outer hyaline indentation in the second posterior cell. Specimens included here are those in which the fork is at least fairly distinct to well marked (see fig. 2, e to 2, g). They are: Muizenberg, Cape Peninsula, xi.1931, 2 ♂♂, 4 ♀♀ (three bred specimens); Pretoria, xii.1912, 1 ♂; Petrusburg, O.F.S., 29.iii.28, 1 ♂ (*H. K. Munro*); Tradouw Pass, Swellendam district, xi.1925 (*S.A. Museum Exp.*), 2 ♂♂, 1 ♀. The British Museum material, collected by R. E. Turner, includes 12 specimens from the Katberg in the Cape, x.1932 to i.1933, one from Ceres, iv.1925, and one from Robertson Pass.

Biology. As specimens of only the two foregoing varieties have been bred, it will be as well to include notes on their biology here. It was during the period October–November 1931 that specimens were first taken in the beating net over low bushes at Camps Bay. The flies were often seen on a certain bush, namely *Metalasia muricata*, and after a search, fair-sized terminal galls were found, specimens of both *S. arcucincta* and *simplex* emerging later. Afterwards galls were found on the same plant at the foot and on the top of the Muizenberg mountain.

The galls are not very conspicuous as the twigs are covered with small, close-set, narrow leaves, the normal tips, which are somewhat thickened, have a rosette appearance. When there is a gall, the tip of the twig looks more elongate, as the terminal leaves are more drawn in to form a more or less noticeable point. The walls of the gall are rather thin and enclose a moderately large cavity. The top (apex) of the gall does not appear to be quite closed in, at least in the full-grown galls, and the fly on emergence forces its way out here. The shining black puparium, one in each gall, lies loose in the cavity.

The host-plant, *Metalasia muricata*, is common at Camps Bay, often occurring singly and then forming bushes six to eight feet in height. At Muizenberg it forms dense thickets four to five feet high on the lower slopes of the mountain; on the top, however, it is low-growing and straggling in its habits. In the last locality, too, the galls were not so well formed; often they were yellowish and readily broke off from the end of the twig.

The fact that both *S. arcucincta* and *S. simplex* were obtained from identical galls on the same plant in the one locality confirms the idea that they are but extremes in one species.

Spathulina arcucincta Bez., var. *elegantula* Bez.

Bezzi, 1924, *Ann. S. Afr. Mus.* **19** : 541, pl. xiv, fig. 89, ♀; *Bull. ent. Res.* **15** : 134.

Munro, 1929, *Ann. S. Afr. Mus.* **29** : 20. *diminuta* Bez., as var. of *elegantula*. References as above, but fig. 90 for the first.

Specimens in which the bar at the base of the wing is broken into spots seem to occur here and there, and to be nowhere common. The apical fork is usually distinct.

I have a ♀ from Camps Bay (xi.1931) taken with the *arcucincta-simplex* series, and another from the South African Museum taken on the Matroosberg, Ceres district. In the British Museum material are 3 ♂♂, Aus, S.W. Africa, xii.1925; a ♂, Worcester, Cape, ix.1928, and a ♀, Matjesfontein, Cape, xii.1928, all collected by R. E. Turner.

***Spathulina arcucineta* Bez., var. *arida* var. n.**

It is the series of specimens placed here, that is, those (fig. 2, h) with three indentations in the second posterior cell and the apical fork usually well developed, that may most likely represent a distinct species. With the exception of two specimens in the British Museum from Swellendam, Cape (i.-ii.1932, R. E. Turner), all I have were taken in the drier areas from the Middelburg to the Hopetown districts in the northern Cape Province and in the south-western part of the Orange Free State. The localities are: Amandelpan, 30 miles west of Hopetown, 5 ♂♂, 13 ♀♀; Schoombie, Cape, 1 ♂; Naauwpoort, Cape, 1 ♀; Belmont, Cape, 1 ♂; Michville, O.F.S., 2 ♂♂, 1 ♀; Koffiefontein, O.F.S., 1 ♀.

The holotype male and allotype female are included in the specimens from Amandelpan, the remainder being paratypes.

This variety agrees with *S. arcucineta* in all characters, only the wing-pattern is rather less variable and the apical fork well defined. The third indentation in the second posterior cell is the middle one; it may reach the fourth vein like the other two, but is often short.

***Spathulina euarestina* Bez.**

Bezzi, 1924, *Ann. S. Afr. Mus.* **19** : 543, pl. xiv, fig. 93, ♀; *Bull. ent. Res.* **15** : 134.

Only the single female type is known. It was taken at Bethulie in the southern Orange Free State, 18.iv.18 (*J. C. Faure*).

***Spathulina euarestina* Bez. var. *piscatoria* var. n.**

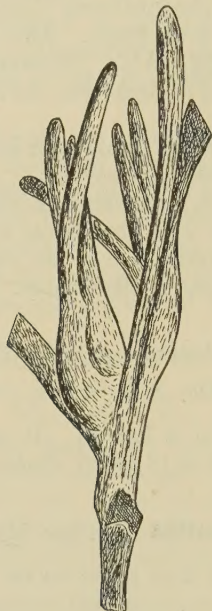
It is possible that this form may prove to be a distinct species. With the little material available, however, it is best perhaps to consider that it and *S. euarestina* are a parallel case with the *arcucineta*-*simplex*-*arida* series.

It resembles *S. hessii* closely, both in wing-pattern and in the length of the base of the ovipositor; it is, however, a smaller species, wing-length 3.5 mm., but specimens of *S. hessii* may be as small. The apical fork is usually distinct, but may be irregular. The male has the hind third of the last abdominal segment polished, and the female has the last segment as in *S. euarestina*, but differs from it in having only two, not three, hyaline indentations in the second posterior cell.

Holotype female (M. 336) Fishhoek, Cape Peninsula, viii.1931, from terminal gall on *Helipterum gnaphaloides*; allotype male (M. 345) from a puparium in a flower of the same plant; 4 ♂♂, 2 ♀♀ paratypes, collected at Fishhoek, x.-xi.1931 (*H. K. Munro*). One male paratype, Hottentots Holland Mountains, Caledon, Cape, 1916 (*K. H. Barnard*) (from South African Museum).

Biology. Galls were first discovered on *Helipterum gnaphaloides* about 1928, but no flies were obtained then. Later, Mr. P. B. Cloete at Capetown kindly collected a good number of plants which he sent to me in Pretoria, but flies were not bred, although galls were present. It was not till 1931 that flies were reared, and then only one from a gall and one from a flower. The plant is common on the top of Elsies Peak above Fishhoek on the Cape Peninsula; it forms a dense bush a foot to eighteen inches high and has a whitish appearance as the leaves and stems are very woolly or felted. The galls (fig. 3), which are terminal, are difficult to find. A gall is not much thicker than the rather swollen, normal twigs, and is hidden by the terminal leaves; when the latter

are pulled away, the gall is seen to be well formed. Further, the twigs that bear galls are short and hidden inside the bush; it seems that the eggs are laid while the shoots are still young, causing them to cease growth, hence they become concealed when the surrounding, uninfested twigs grow longer and eventually bear flowers. Galls were never very numerous; seven galls were found on one plant with about two hundred shoots.



3

FIG. 3.—*Spathulina euarestina* var. *piscatoria* Mro. Gall on *Helipterum gnaphaloides*.

The walls of the gall are thin but firm, enclosing a large cavity in which the dull black puparium lies loose. Before pupating the larva scrapes away the roof of the gall and the fly forces its way out through this and through the felt at the base of the leaves. As one puparium was found in a flower, it seems that the insect is able to adapt itself to changed conditions; it is possible that in this case the egg was laid at a later date than usual and when no more suitable young twigs were available. It may be noted that flies had emerged from galls collected from August onwards, and it is likely that emergence takes place mainly in July or late June, months in which I have not been at the Cape.

Spathulina péringueyi Bez.

Bezzi, 1924, *Ann. S. Afr. Mus.* **19** : 538, pl. xiv, fig. 83; ♀; *Bull. ent. Res.* **15** : 134.
Munro, 1929, *Ann. S. Afr. Mus.* **29** : 19.

Since my last published records on this species, a few specimens have been reared from terminal galls on the same host-plant previously recorded, namely *Elytropappus rhinocerotis*, kindly collected by Mr. F. H. Lanham at Grahams-town, in September 1936.

This is the smallest species of the group, having a wing-length of 2.0 mm.

to 2.5 mm. It is conspicuous by the rounded abdomen which is much wider, about one-third, than the thorax. The base of the ovipositor is about one-fifth the wing-length. The hyaline spots on the wing are fewer, and there is only one indentation in the second posterior cell, rarely a trace of an outer one.

It is very numerous, and I have a large series of bred and collected specimens, mainly from the Cape Peninsula.

***Spathulina péringueyi* Bez. var. *triplex* var. n.**

The holotype is a single female in the British Museum collected at Swellendam, Cape Province, ii.1932 (*R. E. Turner*). It is quite like specimens of *S. péringueyi* of similar size, but has three hyaline indentations in the second posterior cell, the innermost reaching the fourth vein, but the outer two not. The apical fork is not developed in any specimens of *S. péringueyi* I have seen, but the presence of the outermost one in this seems to show that specimens in which the fork is distinct may be found.

